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09/997,056	11/29/2001	Ronnie Ira Chaiken	50037.71US01	4833
27488 7590 01/15/2008 MERCHANT & GOULD (MICROSOFT) P.O. BOX 2903 MINNEAPOLIS, MN 55402-0903			EXAMINER DAO, THUY CHAN	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

09/997,056

**Applicant(s)**

CHAIKEN ET AL.

**Examiner**

Thuy Dao

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,11-13,19-20 is/are pending in the application.
- 4a) Of the above claim(s) 10 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,11-13,19-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Applicant's submission filed on October 29, 2007 has been entered.

2. Claims 1, 3-8, 11-13, and 19-20 have been examined.

### **Response to Amendments**

3. Per Applicants' request, claims 1, 4, 11, and 19-20 have been amended; claims 10 and 14 have been canceled.

### **Response to Arguments**

4. Applicants' arguments have been considered but are moot in view of the new ground(s) of rejection.

### **Claim Rejections – 35 USC § 101**

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1 and 3 are rejected because the claimed invention is directed to non-statutory subject matter:

Independent claim 1 directs to "[a] computer system", which may comprise only software components as described in FIG. 2: "a plurality of procedures" (Procedures P1 and P2, page 8: 24-25), "a runtime for generating unwind data" (Runtime 210, page 9: 8-13), and "a unwind rewriter programmed to obtain the unwind data..." (Unwind Rewriter 208, page 9: 14-19).

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Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are not capable of causing functional change in the computer. See, e.g., *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory). Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory.

Similarly, computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035. Accordingly, it is important to distinguish claims that define descriptive material per se from claims that define statutory inventions. See MPEP 2106.

Dependent claim 3 does not cure the deficiencies as noted above, thus, also amount to Functional Descriptive Material: "Data Structures" representing descriptive material per se or "Computer Programs" representing computer listings per se.

Under the principles of compact prosecution, claims 1 and 3 have been examined as the Examiner anticipates the claims will be amended to obviate these 35 USC § 101 issues. For example (proposal only), - - A computer system,

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embedded in a computer-readable storage medium, for generating metadata for use during stack unwinding ... - - as similarly recited in independent claims 19-20.

### **Claim Rejections – 35 USC § 103**

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 3-8, 11-13, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed (art of record, US Patent No. 6,760,903) in view of US Patent No. 4,866,599 to Morganti et al. (art made of record, hereinafter "Morganti").

#### **Claim 1:**

Morshed discloses *a computer system for generating metadata for use during stack unwinding, comprising:*

*a plurality of procedures, wherein each procedure comprises a sequence of binary instructions (e.g., FIG. 3, Intermediate Representation IR Data 64, col.6: 49 – col.7: 19, col.7: 46-63; FIG. 14, classes and methods in classes, col.22: 19-40);*

*a runtime for generating unwind data, wherein the unwind data includes a first plurality of blocks of metadata having a first order of blocks (e.g., FIG. 4, IR Tree 66, col.7: 20-45; FIG. 5, tree 80 as IR Tree 66, col.8: 11-65),*

*wherein each block of metadata is associated with a corresponding procedure in the plurality of procedures (e.g., FIG. 13, metadata of each class instances and method in said class instances, col.21: 18-41),*

*wherein each block of metadata in the plurality of blocks of metadata includes at least one unwind table (e.g. col.13: 44-54; col.14: 35-43) and*

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*at least one unwind information block (e.g., FIG. 6, col.9: 14 – col.10: 61; col.7: 46 – col.8: 48); and*

*an unwind rewriter programmed to obtain the unwind data and reorder the first plurality of blocks of metadata to generate a second plurality of blocks of metadata having a second order (e.g., FIG. 4, Instrumentation Software 63, Instrumentation Data 69, col.7: 20-62),*

*wherein the unwind rewriter reorders the first plurality of blocks in accordance with a second unwind table and a second unwind information block (e.g., col.25: 57-67; col.27: 7-16; col.27: 51 – col.28: 6),*

*wherein the first plurality of blocks are reordered in response to a modification of the sequence of binary instructions within a procedure (e.g., FIG. 14, col.22: 19 – col.23: 29),*

*such that the second plurality of blocks of metadata accurately represents the same runtime semantics as that of the unmodified sequence of binary instructions (e.g., FIG. 3, Instrumentation IR Data 65, output Object Code 46, col.6: 19 – col.7: 19).*

Morshed does not explicitly disclose the remaining limitations. However, in an analogous art, Morganti further discloses:

*wherein reordering the first plurality of blocks in accordance with a second unwind table and a second unwind information block further comprises determining when basic blocks identified in a single unwind table associated with the first order of blocks are associated with more than one unwind table associated with a current order of basic blocks (e.g., FIG. 9-12, col.12: 60 – col.13: 32), and*

*creating a new region header describing a region of zero length when the basic blocks identified in the single unwind table associated with the first order blocks are associated with more than one unwind table associated with the current order of basic blocks (e.g., FIG. 8C, col.12: 3-29).*

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Morganti's teaching into Morshed's

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teaching. One would have been motivated to do so to insure the integrity of the stack and execution context as suggested by Morganti (e.g., col.12: 3-29).

**Claim 3:**

The rejection of claim 1 is incorporated. Morshed also discloses *the at least one unwind information block includes a region header describing a region of zero length* (e.g., FIG. 23, col.29: 36 – col.30: 16).

**Claim 4:**

Morshed discloses *a computer-implemented method of regenerating unwind data for a modified binary procedure wherein a current order of basic blocks within the modified binary procedure differs from an original order of the basic block the computer-implemented method comprising:*

*obtaining original unwind data that describes the original order of the basic blocks* (e.g., FIG. 4, IR Tree 66, col.7: 20-45; FIG. 5, tree 80, col.8: 11-65),

*wherein the original unwind data is associated with an unwind table and unwind descriptor records* (e.g., col.21: 18-41; col.13: 44-54; col.14: 35-43; col.9: 14 – col.10: 61; col.7: 46 – col.8: 48);

*regenerating new unwind data from the original unwind data, wherein regenerating new unwind data includes generating new unwind tables and new unwind descriptor records* (e.g., FIG. 20, col.25: 57-67; col.27: 7-16; col.27: 51 – col.28: 6),

*wherein the new unwind data includes a reordering of the original order of basic blocks* (e.g., col.7: 20-62), and

*wherein the reordering represents the same runtime semantics as that of the unmodified sequence of binary instructions* (e.g., col.6: 19 – col.7: 19); and

*writing the new unwind data to the modified binary procedure* (e.g., FIG. 4, col.7: 20-62; col.6: 19 – col.7: 19).

Morshed does not explicitly disclose the remaining limitations. However, in an analogous art, Morganti further discloses:

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*regenerating the new unwind descriptor records further comprises determining when basic blocks identified in a single unwind table associated with the original order of basic blocks are associated with more than one unwind table associated with the current order of basic blocks (e.g., FIG. 9-12, col.12: 60 - col.13: 32), and*

*creating a new region header describing a region of zero length when the basic blocks identified in the single unwind table associated with the original order of basic blocks are associated with more than one unwind table associated with the current order of basic blocks (e.g., FIG. 8C, col.12: 3-29).*

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Morganti's teaching into Morshed's teaching. One would have been motivated to do so to insure the integrity of the stack and execution context as suggested by Morganti (e.g., col.12: 3-29).

**Claim 5:**

The rejection of claim 4 is incorporated. Morshed also discloses *obtaining the unwind data comprises parsing the original unwind data that describes the original order of the basic blocks (e.g., col.13: 44-54; col.9: 14 – col.10: 61).*

**Claim 6:**

The rejection of claim 5 is incorporated. Morshed also discloses *parsing the original unwind data comprises identifying a start basic block and an end basic block era region associated with the modified binary procedure (e.g., col.21: 18-41; col.8: 11-65).*

**Claim 7:**

The rejection of claim 6 is incorporated. Morshed also discloses *identifying the end basic block of the region further comprises splitting a single basic block into two basic blocks, such that a first basic block ends on a last instruction of the region (e.g., col.7: 2045; col.22: 19-40).*



**Claim 8:**

The rejection of claim 6 is incorporated. Morshed also discloses *parsing the original unwind data further comprises identifying an unwind information block associated with a basic block in the original order of the basic blocks that includes a when action description record and establishing a link between the when action description record and the corresponding instruction in the basic block (e.g., col.7: 46 – col.8: 48; col.25: 57-67).*

**Claim 11:**

Morshed discloses *a computer-implemented method for regenerating unwind data in response to a binary modification to a procedure, the procedure including a plurality of basic blocks, comprising:*

*receiving unwind data comprising an unwind table and a plurality of unwind descriptor records (e.g., col.21: 18-41; col.13: 44-54; col.9: 14 – col.10: 61)*

*wherein the unwind data is associated with a procedure having binary instructions (e.g., col.22: 19-40);*

*modifying the procedure to perturb the binary instructions of the procedure (e.g., col.7: 20-62);*

*parsing the unwind data to identify a start basic block and an end basic block for a region associated with the procedure (e.g., FIG. 53, col.63: 54 – col.64: 59; col.7: 20-45; col. 8: 11-65; col.13: 44-54); and*

*rewriting the unwind data, wherein the rewriting of unwind data includes a reordering of unwind data, in accordance with a second unwind table and a second plurality of unwind descriptor records (e.g., FIG. 20, col.25: 57-67; col.27: 7-16; col.27: 51 – col.28: 6)*

*such that the rewritten unwind data accurately represents the runtime semantics of the binary instructions before the binary instructions were perturbed (e.g., col.7: 20-62; col.6: 19 – col.7: 19).*

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Morshed does not explicitly disclose the remaining limitations. However, in an analogous art, Morganti further discloses:

*semantics of the binary instructions before the binary instructions were perturbed, wherein generating the second plurality of unwind descriptor records further comprises determining when basic blocks identified in a single unwind table associated with the unmodified procedure are associated with more than one unwind table associated with the binary modified procedure (e.g., FIG. 9-12, col.12: 60 – col.13: 32), and*

*creating a new region header describing a region of zero length when the basic blocks identified in the single unwind table associated with the unmodified procedure are associated with more than one unwind table associated with the binary modified procedure (e.g., FIG. 8C, col.12: 3-29).*

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Morganti's teaching into Morshed's teaching. One would have been motivated to do so to insure the integrity of the stack and execution context as suggested by Morganti (e.g., col.12: 3-29).

**Claim 12:**

The rejection of claim 11 is incorporated. Morshed also discloses *parsing the unwind data further comprises generating a relationship between a when-descriptor within an unwind descriptor record and an instruction in the procedure, and rewriting the unwind data further comprises associating the when-descriptor with an appropriate unwind descriptor record in the second plurality of unwind descriptor records (e.g., FIG. 53, col.63: 54 – col.64: 59).*

**Claim 13:**

The rejection of claim 11 is incorporated. Morshed also discloses *identifying the end basic block of the region further comprises splitting a single basic block into two basic blocks, such that a first basic block ends on a last instruction of the region (e.g., col.21: 18-41; col.7: 46 – col.8: 48).*

**Claim 19:**

Morshed discloses *a computer-readable storage medium having computer-executable instructions for rewriting unwind data in response to a binary modification to a procedure, the procedure including a plurality of basic blocks, the instructions comprising:*

*receiving unwind data comprising an unwind table and a plurality of unwind descriptor records (e.g., col.21: 18-41; col.13: 44-54; col.14: 35-43; col.9: 14 – col.10: 61)*

*wherein the unwind data is associated with a procedure having binary instructions (e.g., col.6: 49 – col.7: 19; col.7: 46-63; col.22: 19-40);*

*modifying the procedure to perturb the binary instructions of the procedure (e.g., col.7: 20-62);*

*parsing the unwind data to identify a start basic block and an end basic block for a region associated with the procedure (e.g., col.22: 19-40; col.8: 11-65; FIG. 4, Instrumentation Software 63); and*

*rewriting the unwind data, wherein the rewritten unwind data includes a reordering of the unwind data according to a second unwind table and a second plurality of unwind descriptor records (e.g., col.25: 57-67; col.27: 7-16; col.27: 51 – col.28: 6)*

*such that the rewritten unwind data accurately represents the runtime semantics of the binary instructions before the binary instructions were perturbed (e.g., col.22: 19 – col.23: 29; col.6: 19 – col.7: 19).*

Morshed does not explicitly disclose the remaining limitations. However, in an analogous art, Morganti further discloses:

*wherein reordering of the unwind data according to a second unwind table and a second plurality of unwind descriptor further comprises determining when basic blocks identified in the unwind table are associated with more than one unwind table associated with the binary modified procedure (e.g., FIG. 9-12, col.12: 60 – col.13: 32), and*

*creating a new region header describing a region of zero length when the basic blocks identified in the unwind table associated with the unmodified procedure are associated with more than one unwind table associated with the binary modified procedure (e.g., FIG. 8C, col.12: 3-29).*

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Morganti's teaching into Morshed's teaching. One would have been motivated to do so to insure the integrity of the stack and execution context as suggested by Morganti (e.g., col.12: 3-29).

**Claim 20:**

Morshed also discloses a computer-readable storage medium having computer-executable instructions for rewriting unwind data wherein a current order of basic blocks within the modified binary procedure differs from an original order of the basic blocks, the instructions comprising:

*obtaining original unwind data that describes the original order of the basic blocks (e.g., col.7: 20-45; col.8: 11-65; col.21: 18-41),*

*wherein the original unwind data is associated with an unwind table and unwind descriptor records (e.g., col.13: 44-54; col.14: 35-43; col.9: 14 – col.10: 61; col.7: 46 – col.8: 48);*

*rewriting the original unwind data, wherein the rewritten unwind data includes a reordering of the original order of basic (e.g., col.7: 20-62; col.25: 57-67),*

*wherein rewriting the original unwind data includes parsing the original unwind data to identify a start block and an end block for region headers associated with the procedures in the modified binary procedures blocks (e.g., col.13: 44-54; col.9: 14 – col.10: 61; col.21: 18-41),*

*wherein the identified start block and the identified end block are recorded in a procedure side table (e.g., col.27: 7-16; col.27: 51 – col.28: 6; col.22: 19 – col.23: 29),*

*generating a new unwind table based in the procedure side table (e.g., col.6: 19 – col.7: 19; col.8: 11-65),*

*generating new unwind descriptors based on the procedure side table and the new unwind table (e.g., FIG. 3, output Object Code 46, Instrumentation IR Data 65, col.7: 20-62).*

Morshed does not explicitly disclose the remaining limitations. However, in an analogous art, Morganti further discloses:

*reordering the original unwind data according to the new unwind table and the new unwind descriptors, wherein reordering includes determining when basic blocks identified in the new unwind table are associated with more than one unwind table (e.g., FIG. 9-12, col.12: 60 – col.13: 32) and*

*creating a new region header describing a region of zero length when the basic blocks identified in the new unwind table are associated with more than one unwind table (e.g., FIG. 8C, col.12: 3-29).*

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Morganti's teaching into Morshed's teaching. One would have been motivated to do so to insure the integrity of the stack and execution context as suggested by Morganti (e.g., col.12: 3-29).

### **Conclusion**

9. Any inquiry concerning this communication should be directed to examiner Thuy Dao (Twee), whose telephone/fax numbers are (571) 272 8570 and (571) 273 8570, respectively. The examiner can normally be reached on every Tuesday, Thursday, and Friday from 6:00AM to 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam, can be reached at (571) 272 3695.


The fax phone number for the organization where this application or proceeding is assigned is (571) 273 8300.

Any inquiry of a general nature of relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is (571) 272 2100.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

T. Dao



**TUAN DAM**  
**SUPERVISORY PATENT EXAMINER**